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EXAMINER

KRAIG, WILLIAM F

ART UNIT	PAPER NUMBER
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2815

DATE MAILED: 01/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/799,961

Applicant(s)

HOFFMAN ET AL.

Examiner

William Kraig

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 December 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-57 is/are pending in the application.
- 4a) Of the above claim(s) 21-36 and 45-47 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20, 37-44 and 48-57 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 31204 & 61305.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Examiner acknowledges Applicant's traversal of the Restriction requirement of Nov. 30, 2005. Applicant first argues that the Examiner, in identifying groups I and III has provided no argument or explanation how these items are independent and distinct as required by 35 U.S.C. 121, and that the Examiner has not indicated as to why prosecution of claims 45-47 (Invention group III) presents any serious burden when Examiner must search the same class and subclass for Invention group I. Examiner refers Applicant to paragraph 3 of the Restriction requirement dated 11/30/05:

"Inventions I and III are related as product and process of use. The inventions can be shown to be distinct if either or both of the following can be shown: (1) the process for using the product as claimed can be practiced with another materially different product or (2) the product as claimed can be used in a materially different process of using that product (MPEP § 806.05(h)). In the instant case, the method of claim 45 can also be practiced with a materially different product from the device of claims 1-20 wherein the channel includes thallium. The method of claim 45 can also be practiced with a materially different product from the device of claim 48 wherein there is only one pixel device."

In the above paragraph, the Examiner has laid out the necessary argument (as defined in MPEP 806.05(h)) as to how Inventions I and III are independent and distinct.

Examiner next refers Applicant to paragraph 4 of the Restriction requirement dated 11/30/05:

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"Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classifications and *divergent subject matter*, restriction for examination purposes as indicated is proper."

The Examiner clarifies that, while Inventions I and III are not separated by a difference in classification, they are separated by their divergent subject matter. As the Examiner has already made clear, the method of using the device can be practiced with a materially different product from the device of claims 1-20, and thus, a complete search for the method of use will require not only a search for the device of claims 1-20 and the method of use for that device, but also will include a search for any other materially different device (and the method of using said devices) with which the method of claim 45 can be practiced.

Therefore, the Restriction Requirement of 11/30/05 is made final. Examiner will treat claims 1-20, 37-44, and 48-57, as indicated in the Applicant's election, herein.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1, 4, 5, 8, 9, 12, 13, 16, and 17 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites the limitation "the gate electrode" on line 9 of the claim. There is insufficient antecedent basis for this limitation in the claim.

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Claims 4, 5, 8, 9, 12, 13, 16, and 17 recite the limitation "the metal oxide". There is insufficient antecedent basis for this limitation in the claims. Examiner recommends amending the claims so that they more distinctly describe the limitation to which they refer (i.e., in claim 4, replace "the metal oxide" with --the one or more compounds of the formula $A_xB_xO_x$ --).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-20, 37-44, and 48-57 rejected under 35 U.S.C. 103(a) as being unpatentable over Cillessen et al. (U.S. Patent # 5744864).

Regarding claim 1, Fig. 4 of Cillessen et al. discloses a semiconductor device, comprising:

a drain electrode (2);

a source electrode (3);

a channel (4) contacting the drain electrode (2) and the source electrode (3), wherein the channel includes one or more compounds of the formula $A_xB_xO_x$, wherein each A is selected from the group of Ga, In, each B is selected from the group of Ge, Sn, Pb, each O is atomic oxygen, and each of A and B being

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different (Cillessen et al., Col. 2, Lines 13-21) (Cillessen describes the use of compounds of oxides including Ga, In, Ge, Sn and Pb, for the semiconductor material in a switching element); and

a gate dielectric (6) positioned between a gate electrode (5) and the channel (4).

Cillessen et al., however, fails to disclose each x being independently a non-zero integer.

It would have been obvious to one of ordinary skill in the art to make each x an independent non-zero integer. The claims to a specific limitation on the values of x in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 2, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 1, but fails to disclose the one or more compounds of the formula $A_xB_xO_x$ including a ratio of A:B, wherein A, and B, are each in a range of about 0.05 to about 0.95.

It would have been obvious to one of ordinary skill in the art to make the one or more compounds of the formula $A_xB_xO_x$ include a ratio of A:B, wherein A, and B, are each in a range of about 0.05 to about 0.95. The claims to a specific limitation on the value of the ratio of A to B in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 3, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 1. The examiner takes official notice that it is well known in the art to form metal oxides in an amorphous form.

Regarding claim 4, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 1, wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium oxide, gallium-tin oxide, gallium-lead oxide, indium-germanium oxide, indium-tin oxide, indium-lead oxide (Cillessen et al., Col. 2, Lines 13-21).

Regarding claim 5, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 4, but fails to disclose the one or more compounds of the formula $A_xB_xO_x$ including an atomic composition of ratio A:B, wherein A, and B, are each in a range of about 0.05 to about 0.95.

It would have been obvious to one of ordinary skill in the art to make the one or more compounds of the formula $A_xB_xO_x$ include a ratio of A:B, wherein A, and B, are each in a range of about 0.05 to about 0.95. The claims to a specific limitation on the value of the ratio of A to B in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 6, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 1, wherein the one or more compounds of the formula $A_xB_xO_x$ includes C_x , to

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form a compound of the formula $A_xB_xC_xO_x$, wherein each C is selected from the group of Ga, In, Ge, Sn, Pb, each O is atomic oxygen, and wherein each of A, B, and C are different (Cillessen et al., Col. 2, Lines 13-21).

Cillessen et al., however, fails to disclose each x being independently a non-zero integer.

It would have been obvious to one of ordinary skill in the art to make each x an independent non-zero integer. The claims to a specific limitation on the values of x in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 7, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 6, but fails to disclose the one or more compounds of the formula $A_xB_xC_xO_x$ including an atomic composition of ratio A:B:C, wherein A, B, and C, are each in a range of about 0.025 to about 0.95.

It would have been obvious to one of ordinary skill in the art to make the one or more compounds of the formula $A_xB_xC_xO_x$ include a ratio of A:B:C, wherein A, B, and C, are each in a range of about 0.025 to about 0.95. The claims to a specific limitation on the value of the ratio of A to B to C in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 8, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 1, wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or

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more of gallium-germanium-tin oxide, gallium-tin-lead oxide, gallium-germanium-lead oxide, gallium-indium-germanium oxide, gallium-indium-tin oxide, gallium-indium-lead oxide, indium-germanium-tin oxide, indium-tin-lead oxide, indium-germanium-lead oxide (Cillessen et al., Col. 2, Lines 13-21).

Regarding claim 9, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 8, but fails to disclose the one or more compounds of the formula $A_xB_xC_xO_x$ including an atomic composition of ratio A:B:C, wherein A, B, and C, are each in a range of about 0.025 to about 0.95.

It would have been obvious to one of ordinary skill in the art to make the one or more compounds of the formula $A_xB_xC_xO_x$ include a ratio of A:B:C, wherein A, B, and C, are each in a range of about 0.025 to about 0.95. The claims to a specific limitation on the value of the ratio of A to B to C in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 10, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 6, wherein the one or more compounds of formula $A_xB_xC_xO_x$, includes D_x , to form a compound of the formula $A_xB_xC_xD_xO_x$, wherein each D is selected from the group of Ga, In, Ge, Sn, Pb, each O is atomic oxygen and wherein each of A, B, C, and D are different (Cillessen et al., Col. 2, Lines 13-21).

Cillessen et al., however, fails to disclose each x being independently a non-zero integer.

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It would have been obvious to one of ordinary skill in the art to make each x an independent non-zero integer. The claims to a specific limitation on the values of x in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 11, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 10, but fails to disclose the one or more compounds of the formula $A_xB_xC_xD_xO_x$ including an atomic composition of ratio A:B:C:D, wherein A, B, C, and D, are each in a range of about 0.017 to about 0.95.

It would have been obvious to one of ordinary skill in the art to make the one or more compounds of the formula $A_xB_xC_xD_xO_x$ include a ratio of A:B:C:D, wherein A, B, C, and D, are each in a range of about 0.017 to about 0.95. The claims to a specific limitation on the value of the ratio of A to B to C to D in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 12, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 1, wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-germanium-tin-lead oxide, gallium-indium-germanium-tin oxide, gallium-indium-germanium-lead oxide, gallium-indium-tin-lead oxide, indium-germanium-tin-lead oxide (Cillessen et al., Col. 2, Lines 13-21).

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Regarding claim 13, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 12, but fails to disclose the one or more compounds of the formula $A_xB_xC_xD_xO_x$ including an atomic composition of ratio A:B:C:D, wherein A, B, C, and D, are each in a range of about 0.017 to about 0.95.

It would have been obvious to one of ordinary skill in the art to make the one or more compounds of the formula $A_xB_xC_xD_xO_x$ include a ratio of A:B:C:D, wherein A, B, C, and D, are each in a range of about 0.017 to about 0.95. The claims to a specific limitation on the value of the ratio of A to B to C to D in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 14, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 10, wherein the one or more compounds of formula $A_xB_xC_xD_xO_x$ includes E_x , to form a compound of the formula $A_xB_xC_xD_xE_xO_x$, wherein each E is selected from the group of Ga, In, Ge, Sn, Pb, each O is atomic oxygen and wherein each of A, B, C, D, and E are different (Cillessen et al., Col. 2, Lines 13-21).

Cillessen et al., however, fails to disclose each x being independently a non-zero integer.

It would have been obvious to one of ordinary skill in the art to make each x an independent non-zero integer. The claims to a specific limitation on the values of x in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

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Regarding claim 15, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 14, but fails to disclose the one or more compounds of the formula $A_xB_xC_xD_xE_xO_x$ including an atomic composition of ratio A:B:C:D:E, wherein A, B, C, D, and E, are each in a range of about 0.013 to about 0.95.

It would have been obvious to one of ordinary skill in the art to make the one or more compounds of the formula $A_xB_xC_xD_xE_xO_x$ include a ratio of A:B:C:D:E, wherein A, B, C, D, and E, are each in a range of about 0.013 to about 0.95. The claims to a specific limitation on the value of the ratio of A to B to C to D to E in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 16, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 1, wherein the one or more compounds of the formula $A_xB_xO_x$ includes one or more of gallium-indium-germanium-tin-lead oxide (Cillessen et al., Col. 2, Lines 13-21).

Regarding claim 17, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 16, but fails to disclose the gallium-indium-germanium-tin-lead oxide including an atomic composition of ratio A:B:C:D:E, wherein A, B, C, D, and E, are each in a range of about 0.013 to about 0.95.

It would have been obvious to one of ordinary skill in the art to make the gallium-indium-germanium-tin-lead oxide include a ratio of A:B:C:D:E, wherein A, B, C, D, and E, are each in a range of about 0.013 to about 0.95. The claims to a specific limitation

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on the value of the ratio of A to B to C to D to E in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 18, Fig. 4 of Cillessen et al. discloses a semiconductor device, comprising:

a drain electrode (2);

a source electrode (3);

means for a channel (4) to electrically couple the drain electrode (2) and the source electrode (3); and

a gate electrode (5) separated from the channel (4) by a gate dielectric (6).

Regarding claim 19, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 18. The examiner takes official notice that it is well known in the art to form metal oxides in an amorphous form.

Regarding claim 20, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 18, wherein the source (3), drain (2), and gate (5) electrodes include a substantially transparent material (Cillessen et al., Col. 4, Lines 25-36).

Regarding claim 37, Fig. 4 of Cillessen et al. discloses a semiconductor device formed by the steps; comprising:

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providing a drain electrode (2);

providing a source electrode (3);

depositing a channel (4) including a composition (composition including one or more precursor compounds that include A_x and one or more compounds that include B_x , wherein each A is selected from the group of Ga, In, each B is selected from the group Ge, Sn, Pb) to form a multicomponent oxide and wherein each of A and B are different (Cillessen et al., Col. 2, Lines 13-21) from the composition to electrically couple the drain electrode (2) and the source electrode (3);

providing a gate electrode (5); and

providing a gate dielectric (6) positioned between the gate electrode (5) and the channel (4).

Cillessen et al., however, fails to disclose the step of providing a precursor composition.

The claim to providing a precursor composition is a product by process limitation and is given no patentable weight so long as the final product of said claim is the same as or obvious over the prior art. *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). The particular process of providing a precursor composition is therefore irrelevant given that the final product of the claim is anticipated by Cillessen et al.

Cillessen et al., however, also fails to disclose each x being independently a non-zero integer.

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It would have been obvious to one of ordinary skill in the art to make each x an independent non-zero integer. The claims to a specific limitation on the values of x in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 38, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 37, wherein the one or more precursor compounds includes one or more precursor components that include C_x , wherein each C is selected from the group of Ga, In, Ge, Sn, Pb and wherein each of A, B, and C are different (Cillessen et al., Col. 2, Lines 13-21).

Cillessen et al., however, fails to disclose each x being independently a non-zero integer.

It would have been obvious to one of ordinary skill in the art to make each x an independent non-zero integer. The claims to a specific limitation on the values of x in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 39, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 38, wherein the one or more precursor compounds includes one or more precursor compounds that include D_x , wherein each D is selected from the group of Ga, In, Ge, Sn, Pb and wherein each of A, B, C, and D are different (Cillessen et al., Col. 2, Lines 13-21).

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Cillessen et al., however, fails to disclose each x being independently a non-zero integer.

It would have been obvious to one of ordinary skill in the art to make each x an independent non-zero integer. The claims to a specific limitation on the values of x in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 40, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 39, wherein the one or more precursor compounds includes one or more precursor compounds that include E_x, wherein each E is selected from the group of Ga, In, Ge, Sn, Pb and wherein each of A, B, C, D, and E are different (Cillessen et al., Col. 2, Lines 13-21).

Cillessen et al., however, fails to disclose each x being independently a non-zero integer.

It would have been obvious to one of ordinary skill in the art to make each x an independent non-zero integer. The claims to a specific limitation on the values of x in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 41, Cillessen et al. discloses the semiconductor device of claim 40, but fails to disclose a method wherein depositing the channel includes vaporizing the precursor composition to form a vaporized precursor composition, and depositing

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the vaporized precursor composition using a physical vapor deposition technique including one or more of dc reactive sputtering, rf sputtering, magnetron sputtering, ion beam sputtering.

These claims to a method wherein depositing the channel includes vaporizing the precursor composition to form a vaporized precursor composition, and depositing the vaporized precursor composition using a physical vapor deposition technique including one or more of dc reactive sputtering, rf sputtering, magnetron sputtering, ion beam sputtering are product by process limitations and are given no patentable weight so long as the final product of said claim is the same as or obvious over the prior art. *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). This particular process of vaporizing the precursor composition to form a vaporized precursor composition, and depositing the vaporized precursor composition using a physical vapor deposition technique including one or more of dc reactive sputtering, rf sputtering, magnetron sputtering, ion beam sputtering is therefore irrelevant given that the final product of the claim is anticipated by Cillessen et al.

Regarding claim 42, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 37, wherein providing the source (3), the drain (2), and the gate (5) electrodes includes providing a substantially transparent form of the source, the drain, and the gate electrodes (Cillessen et al., Col. 4, Lines 25-36).

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Regarding claim 43, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 37, but fails to disclose the providing of a liquid form of the precursor composition.

The claim to providing a liquid form of the precursor composition is a product by process limitation and is given no patentable weight so long as the final product of said claim is the same as or obvious over the prior art. *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). The particular process of providing a liquid form of the precursor composition is therefore irrelevant given that the final product of the claim is anticipated by Cillessen et al.

Regarding claim 44, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 43, but fails to disclose an ink-jet deposition technique for forming the channel.

The claim to an ink-jet deposition technique for forming the channel is a product by process limitation and is given no patentable weight so long as the final product of said claim is the same as or obvious over the prior art. *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). The particular ink-jet deposition technique for forming the channel is therefore irrelevant given that the final product of the claim is anticipated by Cillessen et al.

Regarding claim 48, Figs. 4 and 8 of Cillessen et al. discloses a display device, comprising:

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a plurality of pixel devices (Cillessen et al., Col. 7, Lines 46-48) configured to operate collectively to display images (Cillessen et al., Col. 7, Lines 46-48), where each of the pixel devices includes a semiconductor device (1) configured to control light emitted by the pixel device (Cillessen et al., Col. 7, Lines 41-48), the semiconductor device including:

- a drain electrode (2);

- a source electrode (3);

- a channel (4) contacting the drain (2) electrode and the source (3) electrode, wherein the channel (4) includes one or more compounds of the formula $A_xB_xO_x$, wherein each A is selected from the group of Ga, In, each B is selected from the group of Ge, Sn, Pb, each O is atomic oxygen and wherein each of A and B are different (Cillessen et al., Col. 2, Lines 13-21); and

- a gate electrode (5); and

- a gate dielectric (6) positioned between the gate electrode (5) and the channel (4) and configured to permit application of an electric field to the channel (Cillessen et al., Col. 7, Lines 51-53).

Cillessen et al., however, fails to disclose each x being independently a non-zero integer.

It would have been obvious to one of ordinary skill in the art to make each x an independent non-zero integer. The claims to a specific limitation on the values of x in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

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Regarding claim 49, Fig. 4 of Cillessen et al. discloses the display of claim 48, wherein the source (3), the drain (2), and the gate (5) electrodes include a substantially transparent material (Cillessen et al., Col. 4, Lines 25-36).

Regarding claim 50, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 48, but fails to disclose the one or more compounds of the formula $A_xB_xO_x$ including an atomic composition of ratio A:B, wherein A, and B, are each in a range of about 0.05 to about 0.95.

It would have been obvious to one of ordinary skill in the art to make the one or more compounds of the formula $A_xB_xO_x$ include a ratio of A:B, wherein A, and B, are each in a range of about 0.05 to about 0.95. The claims to a specific limitation on the value of the ratio of A to B in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 51, Fig. 4 of Cillessen et al. discloses the display of claim 48, wherein the one or more compounds of the formula $A_xB_xO_x$ includes C_x , to form a compound of the formula $A_xB_xC_xD_xE_xO_x$, wherein each C is selected from the group of Ga, In, Ge, Sn, Pb, each O is atomic oxygen and wherein each of A., B, and C are different (Cillessen et al., Col. 2, Lines 13-21).

Cillessen et al., however, fails to disclose each x being independently a non-zero integer.

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It would have been obvious to one of ordinary skill in the art to make each x an independent non-zero integer. The claims to a specific limitation on the values of x in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 52, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 51, but fails to disclose the one or more compounds of the formula $A_xB_xC_xO_x$ including an atomic composition of ratio A:B:C, wherein A, B, and C, are each in a range of about 0.025 to about 0.95.

It would have been obvious to one of ordinary skill in the art to make the one or more compounds of the formula $A_xB_xC_xO_x$ include a ratio of A:B:C, wherein A, B, and C, are each in a range of about 0.025 to about 0.95. The claims to a specific limitation on the value of the ratio of A to B to C in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 53, Fig. 4 of Cillessen et al. discloses the display of claim 51, wherein the one or more compounds of formula $A_xB_xC_xO_x$, includes D_x , to form a compound of the formula $A_xB_xC_xD_xO_x$, wherein each D is selected from the group of Ga, In, Ge, Sn, Pb, each O is atomic oxygen and wherein each of A, B, C, and D are different (Cillessen et al., Col. 2, Lines 13-21).

Cillessen et al., however, fails to disclose each x being independently a non-zero integer.

Art Unit: 2815

It would have been obvious to one of ordinary skill in the art to make each x an independent non-zero integer. The claims to a specific limitation on the values of x in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 54, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 53, but fails to disclose the one or more compounds of the formula $A_xB_xC_xD_xO_x$ including an atomic composition of ratio A:B:C:D, wherein A, B, C, and D, are each in a range of about 0.017 to about 0.95.

It would have been obvious to one of ordinary skill in the art to make the one or more compounds of the formula $A_xB_xC_xD_xO_x$ include a ratio of A:B:C:D, wherein A, B, C, and D, are each in a range of about 0.017 to about 0.95. The claims to a specific limitation on the value of the ratio of A to B to C to D in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 55, Fig. 4 of Cillessen et al. discloses the display of claim 53, wherein the one or more compounds of formula $A_xB_xC_xD_xO_x$ includes E_x , to form a compound of the formula $A_xB_xC_xD_xE_xO_x$, wherein each E is selected from the group of Ga, In, Ge, Sn, Pb, each O is atomic oxygen and wherein each of A, B, C, D, and E are different (Cillessen et al., Col. 2, Lines 13-21).

Cillessen et al., however, fails to disclose each x being independently a non-zero integer.

Art Unit: 2815

It would have been obvious to one of ordinary skill in the art to make each x an independent non-zero integer. The claims to a specific limitation on the values of x in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 56, Fig. 4 of Cillessen et al. discloses the semiconductor device of claim 55, but fails to disclose the one or more compounds of the formula $A_xB_xC_xD_xE_xO_x$ including an atomic composition of ratio A:B:C:D:E, wherein A, B, C, D, and E, are each in a range of about 0.013 to about 0.95.

It would have been obvious to one of ordinary skill in the art to make the one or more compounds of the formula $A_xB_xC_xD_xE_xO_x$ include a ratio of A:B:C:D:E, wherein A, B, C, D, and E, are each in a range of about 0.013 to about 0.95. The claims to a specific limitation on the value of the ratio of A to B to C to D to E in the chemical formula constitutes an optimization of ranges. *In re Aller, Lacey, and Hall*, 105 USPQ 233 (CCPA 1955)

Regarding claim 57, Fig. 4 of Cillessen et al. discloses the display of claim 48. The examiner takes official notice that it is well known in the art to form metal oxides in an amorphous form.


Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William Kraig whose telephone number is 571-272-8660. The examiner can normally be reached on Mon-Fri 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Parker can be reached on 571-272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

WFK


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PRIMARY EXAMINER